# Did Government Regulations Lower Credit Rating Quality?

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**Abstract**

SEC regulations in 1975 gave select ratings agencies increased market power by increasing barriers to entry and reliance on ratings for regulations. We test whether these regulations led to lower ratings quality. We find that defaults and negative financial changes are more likely for firms given the same rating if the rating was assigned after the SEC action compared to before. Further, firms initially rated Baa post-regulations are 19% more likely to be negatively downgraded to speculative grade than firms rated Baa pre-regulations. These results indicate that the market power derived from the SEC led to ratings inflation.

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# 1 Introduction

Credit ratings assess the creditworthiness of corporate bonds, but the quality of these ratings has been questioned. Credit rating agencies can provide a useful role by more efficiently gathering information on firm default likelihoods and providing that information to dispersed investors. Two key factors that potentially affect credit ratings quality however are the competitive environment in the ratings industry and the use of ratings in rules and regulations.[1] The use of ratings in rules and regulations was solidified in June of 1975, when the Securities and Exchange Commission (SEC) issued new rules that established bank and broker-dealer capital requirements based specifically on ratings. The competitive landscape among credit rating agencies was also significantly altered at this time, as the SEC deemed that only ratings from certain rating agencies (Moody's, Standard and Poor's, and Fitch) could be used in regulations. These agencies were defined for the first time as Nationally Recognized Statistical Ratings Organizations or "NRSROs." The changes certified the value of ratings provided by these NRSROs to companies and investors, thereby giving these rating agencies new significance in the marketplace, and increased barriers to entry in the rating industry reducing competition.[2] Arguably, ratings from these select agencies henceforth had guaranteed value regardless of the quality of the ratings, thus changing their incentive structure. In this paper, we investigate whether this landmark regulatory shift led to lower ratings quality.

Our main tests evaluate whether ratings quality deteriorates after June 1975 (the post "SEC-certification" period). We compare default likelihoods for firms rated before the new regulations to the default likelihoods for firms whose ratings were initiated with the same rating in the post SEC-certification period. If the new rules have no effect on ratings, we would expect that, for example, a firm rated Baa before the rule change should have on average the same probability of default as a firm rated Baa after the rating change. Instead, we

[1] For example, the Dodd-Frank bill calls for investigations into both of these issues.
[2] Section 2 provides more details on the competitive landscape at the time of these SEC rulings.

find that, conditional on a given rating, firms have a greater likelihood of default if they were rated in the post SEC-certification relative to those rated before June 1975. We also examine changes in financial performance, proxied by Altman's Z-score (Altman, 1968), conditional on ratings levels, and find similar results. Over our evaluative period going up to December 1987, firms of a given rating in the post period suffer on average a more pronounced drop in financial performance than firms assigned with the same rating in the pre period. These results indicate that the regulations of 1975 led to ratings inflation thereby lowering ratings quality. Since rating agencies were given a guaranteed client base due to the new regulations, the agencies could focus more on new business generation with less concern for their ratings quality. To our knowledge, this is the first paper to show that the introduction of NRSRO status is at least partially responsible for lower ratings quality.

We conduct two additional tests to estimate the size of this ratings inflation. First, we artificially deflate post SEC-certification ratings to the point at which the ratings would appear to be accurate based on realized default probabilities. Second, we compare actual ratings given post SEC-certification to predicted ratings for those firms based on their fundamentals (e.g., leverage) using a ratings prediction model derived from ratings and firm fundamentals in the pre-period. In both of these tests we find that ratings are inflated approximately one full level (for example, firms rated Baa should be rated Ba).

We next conduct tests that examine the investment grade/speculative grade boundary. If ratings agencies use the incentive of regulatory certification to attract new clients, we expect them to focus on firms who might properly be rated Ba (highest speculative grade rating) by giving them a Baa or better rating (investment grade). We test this conjecture by examining whether firms given an investment grade rating post SEC-certification are more likely to be subsequently downgraded to speculative grade than firms that are rated investment grade pre SEC-certification. We find that they are, and that the effect is concentrated in firms given a Baa rating. Firms given a Baa rating in the post period are over

19% more likely to be subsequently downgraded to speculative grade than firms given a Baa rating in the pre period. The evaluative window is the same for both pre and post issues for all tests, so the results are not driven by different economic conditions. These results are consistent with the SEC conferring a regulatory-based competitive advantage to NRSRO rating agencies, giving them the opportunity to focus on new business creation at the expense of some ratings integrity.

We further explore how incentives may have changed for ratings agencies in the post SEC-certification period by examining whether large or small firms are rated differently following SEC-certification. Despite these new regulations, we argue that ratings agencies must still consider their reputational capital to some extent when determining ratings. As such, we posit that ratings agencies may be more likely to inflate ratings of smaller firms in the post period, since these firms are less visible and therefore negative credit events may have less impact on rating agency reputational capital. For larger firms, ratings agencies might choose to provide ratings that are more accurate to avoid any significant events that would impact their reputation. We provide evidence consistent with this conjecture. While our main result holds for both large and small firms, default likelihoods are higher for small firms in the post period, conditional on ratings levels. Z-scores are also more likely to fall for small firms in the post period compared to large firms. While this evidence indicates that ratings quality deteriorates more for small firms following the SEC action, rating agencies might also choose to provide favorable ratings for larger firms to gain their business, since these are the firms most likely to generate more fee-based revenues in the future. We find some evidence for this, but only for investment grade firms. Large firms rated investment grade in the post period are more likely to be downgraded to speculative grade than large firms rated investment grade in the pre period. So ratings agencies provide favorable ratings to large investment grade firms, but for firms closer to default, they are more likely to provide favorable ratings to small firms.

With any empirical tests relying on an event at a given period of time to provide exogenous variation, one should assess the potential for other contemporaneous changes to confound the interpretation of the results. One such concern would be any changes in macro conditions around the time of the change in regulations.[3] We address this first by using the same evaluative window for outcomes for both the treatment and control groups. This approach guarantees that all bond issues in the pre and post period face the same macro environment during the evaluation period of our predictive tests. Second, we remove from our analysis the data from the November 73 to March 75 recession period to test whether this recession drives our results. We find no evidence of this. Third, we conduct placebo tests, artificially using a rolling window of different (incorrect) years for the cutoff event before and after the actual event. In these cases, we do not find similar results, indicating our results are not driven mechanically by a time trend in the data. Fourth, we run an additional falsification test by running our main specification for the placebo event year of 1983. In doing so, we select a year without any regulatory changes similar to the introduction of NRSRO status; however, that window mimics the macro-environment of our original event window with a two-year recession in 1981-1982 prior to the event year. We do not find a higher likelihood of default for post-recession bonds in this case, thus providing further evidence that our default results are not driven by the macro environment. And finally, the previously mentioned results for Baa firms and small firms provide cross sectional evidence that is difficult to reconcile with alternate explanations.

[3] Our sample period contains a recession in 1973-1974 and another recession in 1981-82. The latter occurs during our evaluative window and impacts all sample bonds equally. The 1973-74 recession occurs during our pre-SEC certification window. Ratings agencies claim to “rate through the cycle”, implying ratings levels are unaffected by changes in macro conditions that are considered normal phases of the business cycle. If a typical recession does not impact subsequent default risk, our results will be unaffected. But if recessions increase default risk and bonds are given the same rating as in a boom phase, bonds rated in a recession will have a higher risk of defaulting simply because they are rated in a recession. In this case the recession of 1973-1974 may impact our results, but since the general level of risk in the economy would be higher in that time period and the recession falls in the pre SEC-certification period, this should introduce a bias *against* finding post SEC-certification ratings inflation. Consistent with this reasoning, our results are stronger when we exclude all bonds from the pre SEC-certification period rated between November 1973 and March 1975, the recession phase according to NBER data.

Another potential confounding event is that Standard and Poor's (S&P) switched their business model from investor-pay to issuer-pay in July 1974. This change might also have led to reduced ratings quality, but our results are distinct from this event for several reasons. First, our tests use Moody's ratings data instead of S&P's given that Moody's switched to issuer-pay several years before in 1970. As such, our tests focus on Moody's to identify a direct impact of the SEC-certification event. Second, these two events do not occur at the same time, so we make use of the 12-month period when they do not overlap to determine which effect is more prevalent. When a careful analysis around these different dates is conducted, our evidence suggests that the SEC-certification effect is driving our results and not the change in payment method.

One other potential implication of the new SEC regulations is that ratings accuracy would deteriorate, such that the information content of differences in ratings would decrease. Rating agencies might rationally exert less effort generally if they know they have a captive customer base, and ratings would therefore become less precise. We find no evidence consistent with this implication. In tests examining rating upgrade and downgrade frequencies, only rating downgrade frequency increases following the regulation. This result is consistent with ratings inflation and a decrease in rating quality but not a decrease in accuracy.[4] Further, default likelihoods appear to maintain ordinal integrity following the regulations (e.g., an A rated firm still has a lower default likelihood than a Baa firm, etc.). Thus the SEC regulation leads to a general upward shift in ratings levels but differences in ratings are still informative. We conclude that ratings agencies use higher levels of ratings to attract clients, but maintain ordinal quality to satisfy investors who continue to seek information from ratings.

To the best of our knowledge, this paper is the first study to examine empirically the introduction of NRSRO status by the SEC in 1975. The introduction of NRSRO status is a

[4] In the reminder of the paper, we will refer to a deterioration in ratings quality as ratings inflation, i.e., upwardly biased ratings. This is different from ratings accuracy, which refers to ordinal integrity of ratings.

watershed event in terms of rating agency certification granted by regulators. According to White (2010): "The Securities and Exchange Commission crystalized the centrality of the three ratings agencies in 1975." Hence, this event provides an ideal setting to test theories of regulatory-based distortions and competition on credit rating agencies. Our paper is related to several lines of ratings research. Opp et al. (2013) provide a theoretical model evaluating the impact of regulations based on ratings and find that "relative to the equilibrium without regulations, the rating agency has an incentive to rate more firms highly." Our paper provides empirical support for the main prediction of their model.

Another complementary area of ratings research examines the impact of ratings regulations on bond yields (e.g. Kisgen and Strahan (2010)), insurance holdings (e.g. Becker and Opp (2013)) and systemic risk (e.g. Hanley and Nikolova (2014)). Kisgen and Strahan (2010) examine the impact of a ratings agency, DBRS, receiving NRSRO status in 2003. They find that DBRS ratings have a significantly greater impact on yields after DBRS is granted NRSRO status. This result confirms that regulations based on ratings are material considerations for firms as they directly affect their cost of capital; thus supporting our contention that regulations give ratings agencies a captive client base through the NRSRO granting process. A second group of papers looks at the differences in ratings quality between issuer pay and investor pay, with the overall conclusion that the investor pay model lowers rating quality. Beaver et al. (2006) and Cornaggia and Cornaggia (2013) find that investor-paid ratings are more accurate than issuer-paid ratings. Bruno et al. (2013) find that when an investor-paid rating agency (Egan Jones) becomes an NRSRO, its ratings quality does not decline. This result is consistent with the superior accuracy of the investor pay based model being maintained even after being granted NRSRO status. Jiang et al. (2012) examine the impact of S&P switching to issuer pay from investor pay in 1974, and find that S&P ratings rise to meet Moody's ratings levels following the switch. Xia (2013) evaluates how investor paid raters positively influence issuer paid rating agencies, while other papers examine the quality of unsolicited ratings under the issuer pay model, including Bannier et al. (2010) and Fulghieri et al. (2013). Our work is also related to the line of research that investigates the impact of ratings competition on ratings quality, both theoretically and empirically, including Bongaerts et al. (2012), Becker and Milbourn (2011), Manso (2013) and Bolton et al. (2012). And finally, other papers examine changes in ratings stringency in more recent time periods (see Blume et al. (1998), and Baghai et al. (2013)), and in particular following the Enron bankruptcy (Alp (2013)).

# 2 Regulatory background of ratings and hypothesis development

In this section we discuss the regulatory background of ratings and the specific event analyzed in this paper. We also describe the key hypotheses that we will test as a result of this event.

## 2.1 Regulatory background

In 1909, John Moody published the first manual of credit ratings called "Moody's Analyses of Railroad Investments". At that time, the United States had the largest corporate bond market in the world, and railroads represented a significant percentage of the market for corporate bonds. John Knowles Fitch founded the Fitch Publishing Company in 1913, and Poor's Publishing Company was established in 1916 (although Henry Vernum Poor first published reports on railroads as early as 1860). The use of ratings in regulations effectively began in the 1930s. Regulations based on credit ratings began as early as 1931, when banks were required to mark-to-market lower rated bonds. In 1936, the U.S. Treasury Department stipulated that banks could not invest in bonds that were deemed "speculative", according to "recognized rating manuals". These regulations of the 1930s arguably represent the biggest initial events with regard to ratings regulations, with 1975 being the second most important. Data limitations preclude us from evaluating events of the 1930s.

In 1951, the National Association of Insurance Commissioners (NAIC) established the Securities Valuation Office (SVO) to assign risk ratings to bonds held in the investment portfolios of insurance companies. Insurance companies' capital requirements are determined by these ratings. At this time, the NAIC began equating the term "investment grade" to bonds with a Baa-rating or better. Investment grade (IG) bonds were therefore bonds with a rating of Baa (BBB) or higher by Moody's (respectively S&P); and speculative grade (SG) bonds (also known as junk bonds or high-yield bonds) were those with a rating of Ba (BB) or lower by Moody's (respectively S&P). This event marks the only significant change to the regulatory landscape from the 1930s until 1975.

The use of ratings in rules and regulations creates the potential for manipulation of the process. At an extreme, one might imagine a firm that desired higher ratings for its investments could simply create a new rating agency and allow it to produce higher ratings for the investments. To address this issue, on June 26, 1975, the SEC set the standard for determining acceptable credit rating agencies when it started to use credit ratings issued only by Nationally Recognized Statistical Rating Organizations (NRSROs) in its rule 15c3-1, which determined net capital requirements for brokers and dealers (SEC Release No. 34-11497). Other regulators followed suit, adopting the notion of NRSRO status for their rating regulations. Beginning with that event, the use of NRSRO ratings in rules and regulations became widespread.

These new rules in 1975 contained two key parts. The first was the new regulation for broker-dealers. The SEC adopted Rule 15c3-1 that set forth broker-dealer haircut requirements that were a function of the credit ratings of those securities. Through this rule, the SEC applied a net capital rule whereby credit ratings became the basis for determining the percentage reduction in the value ("haircut") of bonds held by broker-dealers for the purpose of calculating their capital requirements. The second is the establishment of NRSROs, giving select ratings agencies significant power with respect to rules and regulations. These two events combined represent the most significant event in recent history with regard to ratings regulation. Corporations also took notice of these developments. Recent research suggests that corporations adjust capital structure and investment decisions based directly on concerns for these regulations, confirming the importance of these regulations to rating agency clients (see Kisgen (2006, 2009) and Begley (2013)).

The competitive landscape in the credit rating industry was evolving rapidly in the 1970s. In particular, new entrants threatened the dominance of Moody's, S&P and Fitch. For instance, McCarthy, Crisanti & Maffeir, Inc. was founded in 1975 and later merged in Duff and Phelps, which itself expanded its credit rating services significantly in the early 80s. Up to that point, it was part of a growing number of more specialized agencies such as Thomson Bankwatch, which started its services in 1974 (see Cantor and Packer (1994) for more details). But when the SEC established the use of NRSROs in 1975, only Moody's, S&P and Fitch were grandfathered in. In the 25 years that followed this SEC certification in 1975, only 4 new firms were given NRSRO status, and these ended up merging or being acquired by the big three agencies such that only the original three had NRSRO status 25 years later. The process of obtaining NRSRO status has been contentious, with many firms complaining that they have been unfairly excluded from this select club (see Kisgen and Strahan, 2010). The NRSRO status granted in 1975 led to significantly reduced competition for the three largest ratings agencies. As White (2010) argues, "the Securities and Exchange Commission crystallized the centrality of the three rating agencies in 1975."

The change in regulations in 1975 was largely unexpected as well. Although issues with ratings were increasing, especially given the potential conflicts with the issuer-pay system and the Penn Central bankruptcy of 1970, to our knowledge no public discussion of the possibility of this new regulatory shift preceded the change. The SEC awarded the NRSRO status through a "no-action" letter system, such that a firm could request to use a credit rating agency (CRA) for regulatory purposes, and so long as the SEC granted the "no action" letter for it, the CRA's rating would qualify for regulatory purposes (see Bethel and Sirri (2014) for details). No specific criteria or definition was outlined, but the most important factor was that the rating agency be "nationally recognized" in the United States as a credible provider of ratings. In that regard, the new rule appears to have been somewhat informally determined.[5]

The payment method for the services provided by rating agencies also changed over time. Originally, investors purchased manuals from Moody's or S&P to obtain their ratings reports. This changed from 1970 to 1974, when those agencies switched and began receiving payment from the issuers instead. Widespread use of photocopying began around this time, which may have led to this change since purchased reports could be more easily disseminated without rating agency approval. Importantly for our analysis, Moody's changed its payment method in 1970 whereas S&P changed its payment method in 1974. Our event is in 1975 and we rely solely on Moody's ratings, so these events do not overlap. However, we also consider any potential spillover effects of the S&P change in 1974 with some additional testing. We do not see any direct impact of the S&P event on our tests.

### 2.2 Hypothesis development

Our main hypothesis is that the three ratings agencies designated as NRSROs became more entrenched following the new rules from the SEC in 1975 and therefore had lower incentives to provide quality ratings. With the rise of new entrants in the 1970s, the environment for credit rating agencies became increasingly competitive. However, the barriers to entry established by the NRSRO designation as well as the expansion of the use of ratings in regulations gave these designated rating agencies a significant competitive advantage. Opp et al. (2013) provide a theoretical model evaluating the impact of regulations based on ratings and find that "relative to the equilibrium without regulations, the rating

[5] Under pressure from Congress, the NRSRO granting process was overhauled and formalized with the passage of the Credit Rating Agency Reform Act in 2006 (see Bethel and Sirri (2014) for more details).

agency has an incentive to rate more firms highly." In the post SEC certification period, the three ratings agencies no longer have to provide ratings of the same quality to guarantee a market for their services. Regardless of the quality of the ratings, issuers would demand the ratings for regulatory purposes. In that environment, rating agencies can more easily cater to their clients' needs by inflating ratings thus capturing the regulatory rents granted to them through the NRSRO-designation process. Partnoy (1999) proposes that with this "regulatory license" the ratings agencies would "no longer need to generate valuable information to sustain their reputations for quality over time." Our hypothesis is not so bold. We merely conjecture that the new regulatory regime tilted priorities from quality to new client generation. A direct empirical implication from this hypothesis is that ratings are inflated post SEC certification.

Rating agencies also need to protect their reputation to some extent in order to retain clients and maintain their NRSRO status. So the null hypothesis is that despite the new regulatory power provided by these law changes, ratings agencies continue to provide quality ratings. During this time period, the bankruptcy of Penn Central Transportation Company in 1970 also led to heightened interest in credit quality. Given this, ratings agencies might want to provide even more stringent ratings to establish their credibility, which would work toward this null and away from our alternative hypothesis. Once again, our tests do not require that rating agencies completely ignore quality; only that rating quality would be reduced due to an upward bias.

In our main tests we compare the predictive power of Moody's bond credit ratings at the end of May 1975, the pre SEC-certification period, to the predictive power of Moody's bond credit ratings that were issued between July 1975 and December 1978, the post SEC-certification period.[6] To test this, we compare the realized default likelihood for bonds rated in the pre SEC-certification period to the realized default likelihood for bonds rated in the post

[6] This window length allows us to capture the fact that the NRSRO-based competitive advantage for the top three rating agencies was potentially only gradually recognized following the first "no action" letter in June 1975.

SEC-certification period. While we believe that using realized defaults as the outcome measure is the most direct way to test for a change in ratings quality, we also use changes in financial condition of the firm proxied by changes in firms' Altman Z-Scores (Altman, 1968) as an alternative. This alternative allows us to have a credit risk realization measure for significantly more firms than in the default regressions. Finally, we also explore implications for the cross-section of firms, examining the impact of the regulations on ratings for firms near the investment grade boundary and for small versus large firms.

## 3 Data and summary statistics

To implement the empirical tests, we first collect all credit rating information on bonds that are issued until December 1978 from Moody's Corporate Default Risk Services (DRS) database. We restrict our sample to U.S. corporate issuers of non-convertible bond/debentures ratings. For instance, we exclude sovereign ratings, structured finance ratings and pooled investment vehicles ratings. Within all corporate issuers, we focus our analysis on firms classified as "banks"; "finance"; "industrial"; "transportation" and "utilities." The DRS database provides us with detailed data on each issuer. It also gives us rating data at the time of issuance and all subsequent credit events, including defaults and credit rating changes, over the lifetime of each bond in our sample.

The Altman Z-Score tests require accounting and market data on bond issuers. As such, we hand-collect CRSP and Compustat identifiers for each issuer and then merge these accounting and market data to the Moody's dataset. The resulting data is a dataset that contains credit, accounting and market value variables for each bond in our sample. In particular, these data allow us to compute the Altman Z-score as an alternative credit risk outcome measure for every firm over time.[7] All accounting items are taken from Compustat and the market value of equity is taken from CRSP.

We focus on valid long-term ratings issued by Moody's. The rating classification goes from "Aaa" (highest credit quality) to "C" (lowest credit quality).[8] The letter rating is coded numerically in our data with the highest rating "Aaa" getting the lowest score (1) and the lowest rating "C" getting the highest score (9). Table 1 provides an overview of the sample characteristics.

In Panel A of Table 1, we give the number of issues within each rating category per end of May 1975 for all outstanding issues rated before the SEC-certification (pre-NRSRO status); and for all new issues rated between July 1975 and December 1978 for the post SEC-certification period. Overall, the sample contains 2,496 observations (1,991 pre-NRSO and 505 post-NRSO). Most bond issues have investment grade ratings, i.e. ratings of Baa or better, both in the pre and post period. This result is not surprising given that we analyze a period before the vast increase of the junk bond market in the 1980s. The majority of bonds are issued by industrial firms (~60% of the sample), with bonds of public utility firms being the second most important category in our sample (~20%) and the rest being split between banking, financials and transportation.

Panel B of Table 1 provides averages by credit rating category for four firm-level characteristics known to affect a firm's creditworthiness. In particular, these four firm characteristics are used by Blume et al. (1998) in their rating level prediction analyses. The first variable is book value of total assets in USD millions, a proxy for firm size. The second is leverage, the third is pre-tax interest coverage, and the fourth is operating margin. As would

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[7] The Altman Z-Score is computed as: Z-Score = 1.2*Working Capital/Total Assets + 1.4*Retained Earnings/Total Assets + 3.3*EBIT/Total Assets + 0.6*Market Value of Equity/Book Value of Total Liabilities + 0.999*Net Sales/Total Assets.

[8] We only look at full letter grade ratings. Moody's introduced a more refined rating classification, the so-called "notching", in April 1982. Before April 1982, there was no distinction within a given credit rating category.

be expected, higher rated firms are (1) larger, exhibit (2) less leverage, display (3) higher interest coverage, and have (4) higher operating margin than lower rated firms.

We compute these averages separately for pre-period bond issues vs. post-period bond issues. There are no clear patterns across the two time periods in terms of firm size and interest coverage. Both operating margin and leverage seem to be higher on average in the post-period issues. In our prediction tests, we more formally evaluate whether pre and post firms differ on fundamentals.

# 4 Main Empirical Results

In this section, we first present a graphical analysis of our hypothesis followed by regressions. We then present cross-sectional evidence for investment grade and small versus large firms. Finally, we conduct two additional tests to gauge the size of the ratings inflation, and present some robustness tests.

## 4.1 Default Likelihood and Financial Performance

### 4.1.1 Graphical Evidence

We begin our analysis with a graphical representation of default frequencies by rating category over the period running from July 1975 to December 1987 in Figure 1a. We report separately the default frequencies for bond issues rated in the pre SEC-certification period vs. those rated in the post SEC-certification period.[9] For ratings between Aaa-Aa, there are almost no defaults and, hence, no pronounced increase for post SEC-certification rated bonds. For all other rating categories, the graph shows a clear increase in the default frequency of bonds rated in the post SEC-certification period. To complement this figure, we provide in Figure 1b the average Z-score change by rating category for issues rated by Moody's both

[9] There were no issues assigned a rating between C and Caa in the post-period, hence we do not represent those categories in Figure 1a and 1b.

before and after the SEC-certification. The interpretation is consistent with Figure 1a. There is a greater deterioration in financial condition within almost every credit rating category for the post SEC-certification issues. Both figures are consistent with ratings inflation in the post period.

### 4.1.2 Default Analysis

We now more formally test the relationship documented in the previous section and analyze whether the NRSRO status granted to credit rating agencies in 1975 led to a deterioration of ratings quality by affecting the predictive power of their ratings. Specifically, we test whether Moody's credit ratings differ in predicting defaults before and after the introduction of the NRSRO status. If SEC-certification increased credit rating agencies' market power, the increased market power could lead to inflated ratings as ratings agencies prioritize client formation over quality. To test this, we regress realized defaults on a dummy variable indicating whether the rating was assigned in the pre or in the post SEC-certification period.

In these tests, we control for rating levels by including an indicator variable for each rating level (rating level fixed effects).[10] Controlling for the rating level in this test is crucial because otherwise a higher default likelihood of post SEC-certification period ratings could simply be driven by comparing bonds of different risk classes. Within a given rating category, we predict a systematic bias in the predictive performance of post SEC-certification ratings relative to pre SEC-certification ratings if the new regulatory power of rating agencies affects their incentives to provide quality ratings. Beyond the rating level, we also include industry fixed effects to control for any risk differences between industries not captured by the credit rating. We also control for several firm characteristics and bond characteristics (time-to-

[10] The inclusion of rating level fixed effects addresses the concern that a bond's default risk is a non-linear function of the letter rating grade. We obtain statistically and economically stronger results if we include the numerical rating as a continuous variable instead.

maturity) in some of our specifications. When we include the latter, the sample size is smaller because the data are not available for all bonds in our sample.

Most of our tests do not include firm-specific controls. We argue that any firm-specific factor should be subsumed in the rating because the credit rating is a risk predictor that is designed to summarize firm-specific risk factors. Moreover, while the firms in our sample may differ along any observable or unobservable dimension, such differences should be captured by the credit rating if the rating is a meaningful indicator of credit risk. This implies that, for instance, a Baa rated bond in 1974 should have the same risk of defaulting as a Baa rated bond in 1976, unless the predictive power of both ratings differs. That being said, we do show results of some tests with additional firm level controls, and as expected, our main findings are not affected. Our baseline regression is the following[11]:

$$default_i = \alpha + \beta*post + \gamma*I\{rating\text{-}level\}_i + \delta*controls_i + error_i \qquad (1)$$

The dependent variable $default_i$ is an indicator variable taking on the value of one if a default of bond i occurs within a specified time period ("evaluative window") after the introduction of the NRSRO status; $post_i$ is an indicator variable taking on the value of one for all new issues rated from between July 1975 and December 1978 and zero if the bond issue is from the pre SEC-certification period; $I\{rating\text{-}level\}_i$ correspond to the set of indicator variables for each credit rating level. Only the indicator corresponding to the credit rating of bond i will equal one, with all the others set to zero; $controls_i$ include industry fixed effects controlling for the industry of the bond issuer and in some specifications both firm-specific and bond-level characteristics. For the latter, we specifically control for bond maturity,

[11] The estimation is done using OLS despite the binary character of the dependent variable. Our main results hold if we use logit or probit instead. As an alternative specification framework, we estimate duration models later in this section to take into account censoring in the data.

measured as the remaining time to maturity of bond i in days; $error_i$ is the error term of the regression.

The rating level used in the regressions is the rating as of May 1975 for bonds issued in the pre SEC-certification period and the initial rating of the bonds issued in the post SEC-certification period. The use of the initial rating for the post SEC-certification period bonds assures that we have the smallest possible time difference between the pre and the post SEC-certification period issues. All results hold if we use the end of December 1978 ratings for the post SEC-certification period instead. Standard errors are clustered at the issuer level in all regressions.

For our main test, we have to define a time period ("evaluative window") during which we record the number of defaults for both the pre and post SEC-certification period bond issues. For the baseline analysis, we record all defaults from July 1975 to end of December 1987.[12] The regression coefficient $\beta$ in regression model (1) indicates whether bonds have a different default frequency depending on whether they were issued pre or post SEC-certification, controlling for the respective rating level in a non-linear way. If SEC-certification leads to rating inflation, we would expect $\beta$ to be positive and significant.

Our baseline regression results are shown in Panel A of Table 2. Column (I) of Panel A shows a positive and highly significant coefficient for the post-dummy of 0.0239, implying that the default frequency of post SEC-certification bonds is 2.39 percentage points higher than that of pre SEC-certification bonds after controlling for credit rating fixed effects. This effect is both statistically and economically significant considering that the (unconditional) pre SEC-certification default frequency is only 2.16%. In columns (II) to (V) we include sequentially industry fixed effects, firm characteristics and bond maturity as additional control variables. The results are largely unchanged when we control for industry fixed effects and time to maturity, although the sample size is smaller because of the lack of bond maturity

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[12] In robustness tests below we show that all results hold if we choose longer or shorter time windows.

information in some cases. Finally, in columns (IV) to (VI) we include the four firm-specific variables from Table 1: Asset size, leverage, pre-tax interest coverage, and operating margin.[13] As expected, including firm-specific characteristics does not alter the results. The coefficients for the different rating level indicator variables have to be interpreted relative to the omitted rating category Aaa. They have the sign and magnitude we would expect. In particular, bonds with higher numerical ratings (i.e. higher credit risk) show a higher likelihood of defaulting over time.

By recording defaults over the period from July 1975 until end of December 1987, we are in effect using different time windows over which we estimate the predictive power of ratings across the pre and post SEC-certification bond issues. Specifically, for bonds rated in the pre-period, our time window extends over a period of 12 years and six months. For bonds rated in the post SEC certification period, the window can be as short as nine years for bonds issued in December 1978. The use of different time windows may bias our results, but the bias is against finding a worsening in credit quality for post period rated bonds, since the post period rated bonds have a shorter window during which to default.

We nonetheless run a second test in which we use time windows of same length. Although this test has the advantage of having a predictive window of identical length across pre and post SEC certification bond issues, it has the disadvantage of having non-overlapping years. Specifically, we compare defaults of pre and post SEC certification issues 10 years after they were rated; which corresponds to the period 1975-1985 for pre-period rated issues and 1978-1988 for post-rated bonds. If macro conditions between 1978 and 1988 differ considerably from those between 1975 and 1985, our results could simply reflect changing macro-conditions over those non-overlapping years. The results are displayed in Panel B of Table 2. We find positive and highly significant coefficients for the post-dummy in all six specifications. The magnitude of the economic effect is stronger than before, with coefficients

[13] The reason why the sample size is reduced in these tests is that we were not able to find Compustat data for them. Many of these cases are linked to subsidiaries of larger publicly-traded companies.

ranging from 4.06 to 5.42 percentage points. This finding reinforces the conclusions drawn from Panel A of Table 2.

Finally, we estimate duration models to address the potential concern that differing times to maturity across pre-and post-period issued bonds might lead to censoring in the data. Duration models take into account several types of censoring of the data. In particular, they take into consideration the fact that bond issues may survive (and default) only after Dec 31, 1987 (right censoring). They also take into account the fact that some bond issues might default or arrive to maturity (without defaulting) prior to Dec 31, 1987. For instance, pre-period bond issues mature on average sooner than post-period issued bonds over the evaluative window. Approximately 19% (11%) of pre-period (post-period) bonds mature before the end of our evaluative period, and while the difference is relatively small in magnitude and controlled for in our regressions with a time-to-maturity control variable, we more formally test whether differing time to maturities drive our findings by estimating a Cox proportional hazard model.[14]

Specifically, the differing time to maturities are taken into account in the following way: For pre-period issues, we measure duration as the number of days between May 31, 1975 and the default date; between May 31, 1975 and December 31, 1987 for the pre-period issued bonds that do not default; and between May 31, 1975 and the maturity date for the non-defaulted bonds that come to maturity before December 1987. For the post-period bonds, we measure duration as the difference between the date of the assignment of the initial rating and the default date; between the date of the initial rating assignment and December 31, 1987 for the post-period issued bonds that do not default; and between the date of the initial rating assignment and the maturity date for the non-defaulted bonds that come to maturity before December 1987.

[14] The estimation is performed on the subset of bonds with data on time to maturity (same subsamples as those shown in columns (3) and (6) of Table 2).

The results displayed in Table 3 indicate that differing times to maturity between pre- and post-period issued bonds do not drive our results.[15] Reassuringly, these results are consistent with our main results in Table 2, whereby post-rated bonds are significantly more likely to default after controlling for rating levels and time to maturity. Overall, the findings shown in this section are consistent with our prediction that NRSRO rating agencies would produce inflated ratings after the introduction of the new rating-based SEC regulations in 1975.

### 4.1.3 Z-score Analysis

We expand our default analysis to a broader range of changes in credit risk by employing a widely used and accepted measure, the Altman Z-Score (Altman, 1968), as an alternative outcome variable. The Z-Score has the advantage of being able to detect changes in credit risk for all observations, rather than only for those bonds that actually default. As a result, using this measure allows us to expand the sample size over which we can evaluate the predictive power of credit ratings. However, as the Altman Z-Score cannot be computed for banks, they are not included in the analysis. This restriction and the lack of accounting data for some firms reduce the sample size to 1,063 observations. We run two different regressions. First, we estimate the following regression model:

$$\text{Z-Score change}_i = \alpha + \beta * \text{post} + \gamma * I\{\text{rating-level}\}_i + \delta * \text{starting Z-Score}_i + \text{industry}_i + \text{error}_i \quad (2)$$

In this regression Z-Score $\text{change}_i$ is a dummy variable indicating whether the Altman Z-Score of the issuer of bond i *decreased* over the evaluative window for bonds issued in the pre SEC-certification period compared to bonds issued in the post SEC-certification period; starting $\text{Z-Score}_i$ is the Altman Z-Score of the issuer of bond i at year-end 1974 for the pre

[15] Our results do not change if we use the date of the rating assignment for the pre-period bonds instead of May 31, 1975.

SEC-certification bond issues and at year-end prior to the year in which the initial rating was assigned for the post SEC-certification bond issues.[16] The Z-score change is computed as the difference between the Z-score as of Dec 31, 1987 and the starting Z-score. We define our indicator variable relative to decreases in Z-score so as to reflect a worsening in credit risk. Doing so allows us to have the same interpretation as before for our coefficient of interest β: If the SEC-certification led to inflated ratings, we would expect β to be positive and significant. The inclusion of the starting Altman Z-Score controls for the fact that the initial Z-Score may impact whether or not the Z-score drops during the sample period. The variable $industry_i$ corresponds to industry fixed effects for the issuer of bond i. Panel A of Table 4 contains the baseline Z-score results for the time window until December 1987 (columns 1-2) and the results for the ten year window (columns 3-4), which contains non-overlapping years.

Table 4 shows a positive and highly significant regression coefficient for the post period indicator variable across every specification. This implies that firms that issued bonds in the post SEC-certification period experienced decreases in their Altman Z-Score more often than firms with bonds given the same rating in the pre SEC-certification period, controlling for the starting Altman Z-Score and the rating level in a non-linear fashion. This result is in line with the default frequency results because it suggests that a deterioration of credit risk happened more often for firms whose bonds were rated in the post SEC-certification period. The magnitude of the coefficient indicates that a decrease in Altman Z-Score is approximately 15% more likely for post period rated bonds. The results are almost unchanged when we use ten year, non-overlapping time windows in columns (3) and (4).

In Panel B of Table 4, we modify equation (2) and regress the Altman Z-Score *level* on the post-dummy and controls instead. Once again, we transform the dependent variable and take its negative value such that a positive coefficient for β indicates a greater *drop* in Z-

[16] If the initial rating was assigned, for instance, in September 1975, the starting Z-Score would be the Altman Z-Score as of yearend 1974; if it was assigned in September 1976, the starting Z-Score would be the Altman Z-Score per end of 1975, etc.

scores for post period rated firms. By controlling for the starting Altman Z-Score, this regression essentially estimates the size of the change in the Altman Z-Score for firms that issued bonds in the pre NRSRO period versus firms that issued bonds in the post SEC-certification period. We run this test for both the overlapping time window up to 1987 and the ten year, non-overlapping time window. The results are displayed in Panel B of Table 4. In both cases, we get positive and highly significant coefficients of similar magnitudes. Together, these results provide support for the conjecture that ratings agencies inflated ratings following the change in ratings regulation.

### 4.2 Firms near the investment grade border

In this section, we investigate whether firms for a given investment grade (IG) rating in the pre or post SEC-certification period had a higher likelihood of being downgraded to speculative grade (SG). If SEC-certification led to inflated credit ratings, the likelihood of being downgraded to speculative grade should be higher for the post SEC-certification period issues. We focus on the threshold that separates investment grade from speculative grade because investment-grade credit ratings should be associated with lower financing costs and a higher demand from investors. Hence, ratings agencies might have stronger incentives to inflate ratings and assign investment-grade ratings even if the risk of the bond would not justify an investment-grade rating. As ratings agencies focus more on client generation, Ba-rated firms might be enticed to enter the bond market if given an inflated Baa rating. If this is the case, we expect that IG bonds issued in the post-period are associated with a higher likelihood of being downgraded to speculative grade afterwards. We estimate the following OLS regression model to test this hypothesis:

$$\text{SG-downgrade}_i = \alpha + \beta * \text{post} + \gamma * \text{I}\{\text{rating-level}\}_i + \text{industry}_i + \text{error}_i \qquad (3)$$

In this regression, SG-downgrade$_i$ is a dummy variable taking on the value of one if bond i was downgraded from investment to speculative grade at any given point in time during the evaluative period.[17] All other variables are the same as before. The coefficient β on the post-dummy indicates whether bonds that were rated in the post SEC-certification period had a higher likelihood of being downgraded to speculative grade in the predictive window. If the SEC-certification led to inflated ratings, we would expect β to be positive and significant.

Table 5 Panel A provides summary statistics on the frequency of downgrades below the investment grade threshold before and after the regulatory change. The table displays that for each investment grade rating category, the downgrades to SG are much more pronounced for the post-NRSRO rated bonds. Table 5 Panel B more formally tests whether post-period rated bonds are more likely to be downgraded below the investment grade threshold than pre-period rated bonds. Results in Panel B show that investment grade rated bonds that were issued post SEC-certification had an almost 8% higher likelihood of being downgraded to speculative grade until December 1987 relative to pre SEC-certification issued bonds. This effect is significant at the 1% level. In column 2 of Table 5, we see that the effect is even greater and again highly significant when we use the 10 year non-overlapping time window. These results provide additional evidence of rating inflation post SEC-certification.

In Panel C of Table 5 we focus only on Baa rated firms. Firms near the investment grade distinction have the most to gain from inflated ratings as regulations concentrate significantly at that level. Thus we would expect firms near the border to be especially prone to enticement from ratings agencies of preferential ratings. Tests examining the transition from investment grade to speculative are a natural environment in which to consider this possibility. If firms are given a Baa rating when they in fact deserved a Ba rating or worse, these firms will be the most likely to be downgraded to speculative grade at a later point. The results of Panel C of Table 5 confirm this. Baa rated firms in the post period are especially

[17] In case a bond was downgraded more than once to speculative grade, it is only counted as one downgrade in the analysis.

likely to be downgraded to speculative grade when compared with Baa rated firms before the SEC action. The likelihood of a downgrade to speculative is 19% higher for firms rated Baa in the post period compared to Baa rated firms in the pre period.[18] Together, these results confirm that Baa firms are given favorable ratings in the post period to keep them, at least temporarily, above the investment grade threshold.

### 4.3 Impact of firm size on ratings inflation

To understand rating agencies' motivations and to further rule out alternate explanations, we test whether the deterioration in ratings quality we identify after SEC certification is more prevalent among small or large firms. We consider two competing hypotheses for the impact of size on ratings quality during this period. First, as larger firms are likely to generate more fees than smaller firms, ratings agencies might be more inclined to inflate ratings of larger firms in the post period. Certified ratings agencies can leverage the fact that firms now require ratings for use in regulations in the post period to generate new higher fee paying clients. The second hypothesis is that ratings agencies might be more inclined to give inflated ratings to small firms due to reputational concerns. Even in the post period, ratings agencies have incentives to maintain their reputations. Given that larger firms are more visible than smaller firms, a significant negative credit event for a large well-known company that was rated highly by a rating agency would damage the ratings agency's reputation more. Overall, as defaults are the most visible and detrimental events for rating agencies' reputation, we expect ratings inflation to be more prevalent among smaller firms

[18] While the effect for Baa rated firms only is more than twice as large as for all investment grade rated firms (19% versus 7.8%), the difference is not statistically significant because of the large standard errors associated with our estimates. The same holds when Baa rated firms are compared to A rated firms only. The result for the latter is much smaller, but the difference is not statistically significant because of the large standard errors.

than larger firms.[19]

To test these hypotheses, we run our three main tests on rating quality (using defaults, drop in Z-score dummy, and downgrades to SG as dependent variables) with interactions for the size of the firm. We create a size dummy variable, equal to 1 if the firm is in the upper half of asset size among firms in our sample and zero if below the median asset size. The size dummy is created separately for the pre- and post-period issues. For the post-period issues we further distinguish firm size separately for the years 1975 to 1978. This enables us to explore cross-sectional as well as time-series variation in firm size. We then run regressions including this dummy variable on its own and interacted with the dummy variable for the post period:

$$\text{credit risk outcome}_i = \beta_1{*}\text{post} + \beta_2{*}\text{size}_i + \beta_3{*}\text{size}_i{*}\text{post} + \gamma{*}\text{controls}_i + \text{error}_i \qquad (4)$$

Each specification also includes industry and credit rating level fixed effects. Results from these regressions are shown in Panels A and B of Table 6. The results for the default test are shown in the first column of Panel A. They show that smaller firms are more likely to receive inflated ratings in the post period than larger firms. Both large and small firms are more likely to receive inflated ratings in the post period, given that bonds rated in the post-period are more likely to default after controlling for rating level. However, the result is stronger for smaller firms, with the interaction term being both economically and statistically significant (p-value of 5.3%). This relationship is also supported by the Z-score tests shown in the second column of Panel A, which indicate that small firms rated in the post period are more likely to experience a drop in Z-score, conditional on initial Z-score and rating levels. This result however is not statistically significant because of large standard errors. The

[19] Another hypothesis for the size impact is based on information production. Small firms are more opaque and hence require relatively more effort to rate them. If credit rating agencies do not exert as much effort in rating new issues following SEC-certification, we would expect smaller firms' ratings to be less accurate. If firms' self-select based on ratings levels, more variance in ratings could lead to upwardly biased ratings. As this relationship is more nuanced, we have not emphasized this explanation in this section.

combination of these results indicate that rating agencies are more likely to generate business in the post period by inflating ratings for firms that are less visible and therefore less likely to damage their reputations in the event of an inaccurate rating. Since larger firms are more visible, ratings agencies provide more accurate ratings for these firms in the post period.

The results shown in Panel B of Table 6, examining changes from investment grade to speculative grade, show a different relationship among investment grade firms. The coefficient on the interaction term in these tests is positive and significant, indicating that larger firms' bonds that are initially rated investment grade in the post period are more likely to get downgraded to speculative grade compared to those rated investment grade in the pre period. While a downgrade to speculative grade may indicate an initially inflated rating, the downgrade does not impact the reputation of a rating agency to the degree a default does. So for this set of firms that are initially far from a default, rating agencies appear to focus more on fee generation by targeting larger firms. This result is only significant at the 10% threshold so some caution must be taken in reading too much into it. The coefficient is large, however, indicating a potentially meaningful impact for this group of firms.

We also consider whether these large investment grade firms might be especially prone to take advantage of the favorable ratings assigned to them by issuing bonds prior to ultimately being downgraded to speculative grade. Ratings agencies would also benefit by getting the additional fees from these new bond issues. In an informal analysis, we examine this conjecture by identifying the subset of large investment grade rated firms in the post period that suffer a downgrade to speculative grade over our window of analysis. We can confirm that at least 88% of these firms do bond offerings following their initial investment grade rating and preceding their downgrade to speculative, and for most cases the firms issue multiple bonds during this window. The face value of these bonds totals more than $10 billion, suggesting that the potential benefit of inflated ratings for these firms is non-trivial.

Overall, this anecdotal evidence is consistent with a mutually beneficial motivation for favorable ratings for investment grade firms following the new SEC rules.

### 4.4 Magnitude of ratings inflation

The effects we document above are consistent with inflated ratings for post SEC-certification issued bonds because of ratings agencies' changed incentive structure. In this section, we document the size of the ratings inflation. We test this by artificially deflating all post SEC-certification bond ratings by one and two rating categories and running our baseline default regressions using the deflated ratings variable as a control. We replace all post SEC-certification bond ratings by their rating minus one (one grade below actual), i.e. all bonds with an Aaa rating receive an Aa rating; all bonds with an Aa rating receive an A rating, etc.; while we leave unchanged the pre SEC-certification bond ratings. In these tests, the C (Ca) ratings are excluded when we deflate by one (two) rating categories as these cannot be further deflated. The regression specifications are the same ones of the baseline default regressions. Panel A of Table 7 displays the results.

Column (1) reports the baseline result from Table 2. In columns (2) and (3), we replace the observed bond rating by the artificially deflated post SEC-certification bond ratings by one and two rating categories respectively. After a one rating category deflation, the post-dummy is zero and not significant anymore; it turns negative and significant following a deflation of two rating categories in column (3). This result implies that the post SEC-certification bond ratings are inflated by approximately one full rating category, i.e. bonds rated Baa post SEC-certification would exhibit no rating bias if they were rated Ba instead, etc.[20]

In Panel B of Table 7, we provide the symmetric test by artificially inflating all pre SEC-certification bond ratings by one and two rating categories and run the same tests as

[20] Besides providing insight about the size of the bias, this test also lends credibility to our econometric approach.

above.[21] We find similar results to those from Panel A, whereby the post-dummy is close to zero and not significant after a one rating category inflation and turns negative (albeit not statistically significant) following a two rating category inflation. Taken together, the results in this section provide support for post SEC-certification ratings inflation and suggest that the size of the inflation is substantial.

### 4.5 Assessing Rating Bias from Predicted Ratings

An alternate way to assess ratings bias is to examine whether ratings given after the event appear inflated based on firm financials compared to the financials of similarly rated firms in the pre-period. For example, in the summary statistics in Panel B of Table 1, the average A-rated firm has a leverage of 58.6% in the pre-period compared to 64.5% in the post period, suggestive that A-rated firms are of lower quality in the post period based on this important variable for ratings determination. However, ratings are based on observable and unobservable risk characteristics, so no model relying solely on observables can definitively predict ratings. Hence, we believe examining defaults as the primary outcome variable provides the most direct methodology for assessing whether ratings are inflated. Nevertheless, in this section we examine whether ratings also appear inflated based on firm-specific characteristics.

To determine whether ratings appear inflated based on firm-specific characteristics, we compare actual ratings for firms in the post period to predicted ratings for those firms based on a ratings model derived using pre-period data. Specifically, we estimate a model for ratings predictions by implementing a probit regression of pre-period firms' ratings on their asset size, leverage, pre-tax interest coverage, and operating margin. These four variables are four of the most important drivers of a firm's ratings (Blume et al. (1998), Kamstra et al. (2001) and Kisgen (2006)). Further, given our small sample size, we use these four variables since

[21] The sample size is smaller as we remove Aaa ratings and both Aaa and Aa when we inflate by one (respectively two) rating categories the pre-period bond ratings.

we have data for these variables for most of our sample. We use the firm-specific variables as of December 1973 for the pre-period bonds to account for the fact that firm financials might be depressed at the end of 1974 because of the 1973-1974 recession. Beyond these firm-specific characteristics, we also use the industry of the bond issuer for the matching. We then use the resulting coefficients (available upon request) to yield propensity scores which we match to post-period firms.

Using this model, we compare the rating for the post period issue to what a bond of an issuer with similar size, financials and industry classification would have been rated in the pre-period. Specifically, we propensity score match each post-period bond to a pre-period issue using the nearest neighborhood matching with replacement and compare their credit ratings (outcome variable) by computing the average treatment effect of the treated.[22] Results are displayed in Table 8. The table shows that before matching, the average rating of the pre-period bonds was 2.964 while it was 3.085 for the post-period bonds. The difference between the two is not significant. However, after the matching, the average rating of the pre-period bonds is 4.203. Put differently, given a similar size, leverage, pre-tax interest coverage, operating margin and industry, the predicted numerical rating for the post-period bonds is about one rating category higher than the actual rating. The difference between the predicted and the actual rating is highly significant (t-statistic of -3.65). This result suggests that based on some of the most important firm-specific variables for the determination of a credit rating and the industry of the bond issuer, the post-period bond ratings are inflated by approximately one full rating category. This result corroborates the previous finding where we artificially deflated/inflated the ratings and found similar inflation magnitudes.[23]

[22] The results do not change if we use two, three, four or five control observations for the matching.

[23] These tests are similar to several previous papers which explore whether rating standards change over time (see Blume et al. (1998), Baghai et al. (2013), and Alp (2013)). Those papers implement panel regressions with firm characteristics and year dummy variables. Since we are only interested in examining the post period compared to the pre-period, individual year dummies are unnecessary in our setting. Further, the propensity score matching approach we implement allows for a more precise matching of pre and post firms than simply controlling for firm financials (which those other papers cannot implement given their panel approach). Otherwise, the approaches are the same in design.

### 4.6 Robustness tests

In this section, we provide two robustness tests to demonstrate that our main results hold when we change several assumptions underlying our analyses. The results of these tests are shown in Table 9.[24]

First, in Panel A, we vary the length of the evaluative window. The main results use a time window with an end date of December 1987, so we change the end date to both December 1986 and December 1988.[25] Second, in Panel B we remove any ratings that were assigned in the five months preceding the regulatory change, from January to May 1975 (the introduction of the NRSRO status took place in June 1975), while at the same time varying the length of the evaluative period. Although the SEC actions were to a large degree unexpected (see the description of the "no action" letter process in Section 2), this test accounts for the possibility of any anticipation of the regulatory change. As Table 9 displays, in all of these variations, the results of our main analysis are unchanged.

## 5 Alternate Explanations

With any natural experiment, it is important to show that our results are specific to the event under study and not driven by time trends or some other confounding factor. This section provides several tests designed to help rule out competing explanations for our main findings.

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[24] All tests presented in this section were also done using the Altman Z-Score drop indicator, the negative change in the level of the Altman Z-Score, and downgrades to speculative grade. The results are very similar to the default frequency results, hence not presented for the sake of brevity. They are available upon request from the authors.

[25] We also estimate the regression using December 1985 and December 1989 as end points of our evaluative periods. The results hold in these regressions as well. Time windows ending prior to 1985 are too short for robust statistical inference given the small number of defaults over these short windows. Longer time windows beyond 1989 would overlap with the collapse of the former investment bank Drexel Burnham Lambert, Inc., which created a severe shock to the bond market, especially in the junk bond segment and hence are deemed not appropriate (see Lemmon and Roberts, 2010).

### 5.1 Macro events

The tests in this section are designed to rule out that macro events drive our results. The pre-period for our analysis includes a recession lasting from November 1973 to March 1975. An oil shock occurred in 1973 whereby oil prices rose from approximately $3 to $12 per barrel, a shock that is largely blamed for the ensuing recession. The post period for our results also includes a recession in 1981-1982, but this occurs after any of the ratings in our tests are determined. Our tests also use the same period for the outcomes for both treatment and controls, so to the extent any macro events occur after ratings are measured, they affect both samples equally. So any macro changes in the post period should not compromise our results.

Further, as stated previously, ratings agencies state that they "rate through the cycle". If ratings agencies do not adjust rating levels because of normal ebbs and flows of the business cycle, then a bond rated in a recession will receive the same rating as if it were rated in an expansion. If the timing of when a bond is rated does not impact default risk, this will have no impact on our results. If however bonds rated in a recession have a subsequently higher level of default risk, then ratings will appear inflated when given during recessions. As the 73-75 recession falls into the pre SEC-certification period, this should introduce a bias against finding ratings inflation in the post period (the opposite of what we find). Additionally, our results in the cross section are difficult to reconcile with business cycle effects. For example, changes in the business cycle do not directly imply that Baa firms in particular should receive inflated ratings in the post period. Nevertheless, we conduct several additional tests in this section to rule out that macro events in 1973-1975 are compromising our conclusions.

Our first set of tests alters the years used for analysis in the pre period. Specifically, we remove any bonds that received a rating during the recession of 1973-1975. We conduct separate tests excluding all bonds with newly assigned ratings during 1973, 1974, and during the recession ranging from November 1973 to March 1975, the period which was defined by the NBER as the recession period. Table 10 shows that our main results (reported for reference in column (1)) are unchanged and even slightly stronger for all three main outcome variables when we estimate our tests while removing the rating assignments made during the 73-74 recession period in columns (2) through (4). We conclude from this table that our main results are not driven by the ratings assigned during the 73-75 recession period.

Next, we perform a placebo or falsification test on a rolling window spanning from 1970 to 1980. This test allows us to rule out time trend effects surrounding our event window. We implement this test by running the same specification as in our main test with the only difference being that instead of taking June 1975 as the event month, we use different placebo event years. Table 11 shows the results of these tests. In column (1), we set the placebo event month to be June 1970. Specifically, we record all outstanding bond ratings per end of May 1970 and all newly assigned bond ratings between July 1970 and December 1973. We then record the realized defaults until December 1982, i.e. nine years after the end of the placebo post-period. This test is identical to the baseline default analysis, with the difference being that there was no regulatory event in June 1970. Consequently, we should not find any difference in the default likelihood of the placebo pre and post rated bonds. In column (2) we set the placebo event month to be June 1971 and continue this until we finally set the placebo event month to June 1980 in column (11). Column (6) shows our baseline result from Table 2 (column 2) where June 1975 is the event month. As in our main specification, we control for industry and credit rating level fixed effects.

The pattern we observe from Table 11 highlights the lack of any clear trend both before and after the true event window. The table shows no significance in any placebo event year leading up to 1975. Column (6) is shaded and represents the results from our main specification in Table 2 using the true event window. It is the only year where we find significance with the exception of 1976, the year following the event. The significance obtained for 1976 can be explained by a potentially delayed reaction of Moody's to the regulatory change. By shifting the event window by just one year, there is only a slight misclassification of the pre-period bonds that include all bonds from June 1975 to May 1976 to the pre-period sample. These results would be consistent with Moody's only gradually inflating ratings after June 1975. Once the window is shifted by two or more years, the results disappear. The results in Table 11 reject any concern for time trends affecting our results. We conclude instead that a structural break in 1975 was triggered by the new SEC regulations.

Our last placebo test makes use of the recession of 1981-1982. In Table 12, we replicate all the estimations of Table 2; however, we set the placebo event month to be June 1983 instead of June 1975. In doing so, we replicate the macro environment of our main test by also having a major recession in the two years prior to the event year, i.e. the recession years 1981 and 1982. However, June 1983 does not have the corresponding NRSRO introduction since no rating agency regulatory changes occurred at that time. The results do not show a significantly positive coefficient on the post dummy in any of the specifications. If anything, the coefficient is negative in most of the specifications and even slightly significant when we control for the remaining time to maturity of the bonds measured in days. The lack of results in Table 12 supports that our main results are not driven by the macro environment at the time of the regulatory change under study.

Taken together, the results from the tests in this section show that the deterioration of rating quality documented in this paper is not due to some other confounding event or omitted macro factor during this time period.

### 5.2 S&P's 1974 change in payment method

Jiang et al. (2012) show, that the switch of S&P's business model from investor-pay to issuer-pay affected the quality of S&P's ratings. They argue that after switching to issuer-pay, S&P assigned relatively higher ratings to attract more business and generate higher returns.

The switch in payment model took place around June/July 1974, a time period that is reasonably close to the introduction of the NRSRO status in June 1975. As such, our findings could be related to this event. Specifically, if Moody's were to inflate its ratings in reaction to S&P's change in business practices, it could potentially explain why default frequencies in a given rating class increased. However, we show in this section that our findings are unlikely to be driven by this confounding explanation.

To show that our results are not driven by S&P's switch to issuer-pay, we design the following test. We focus only on ratings of bonds issued in the pre SEC-certification period, i.e. until May 1975. We then use the switch of S&P's payment model in June/July 1974 as the event month and define the dummy variable post-dummy to take on the value of one if the bond was rated between July 1974 and May 1975 and zero if it was rated before July 1974. Focusing on observations until May 1975 enables us to isolate the effect of a potential reaction of Moody's to S&P's payment model switch from the SEC-certification event we focus on in this study.[26] We then run the predictive tests for all three main outcome variables. Other than redefining the post-event dummy, the regression setup is the same as before. If Moody's reacted to inflated S&P ratings after the switch of the payment model, the coefficient of the post-dummy should load positively and significantly in these regressions. Table 13 contains the results.

From column (1) of Table 13, we can see that the coefficient of the post-dummy is not significant and close to zero implying that default frequencies of bonds rated before July 1974 and those rated between July 1974 and May 1975 did not differ significantly regardless of the window over which we record defaults. In column (2), we run the same regressions using the indicator of a drop in Altman Z-Score as the dependent variable. The post-dummy this time loads negatively and is again not statistically significant. Finally, in column (3), we use the

[26] In the placebo post-period from July 1974 to May 1975, there are 276 bond ratings. This represents 14% of the sample that includes 1,719 bond ratings from the placebo pre-period up to May 1974. We believe that this is a sufficiently large sample size to be able to draw statistical inference from this test.

indicator of a downgrade to speculative grade as the dependent variable. The coefficient of the post-dummy is again negative and not significant. In all, these results suggest that the deterioration in Moody's rating quality was not caused by a reaction to S&P's switch to the issuer-pay model.[27]

### 5.3 Ratings Accuracy

An alternative implication of the regulatory change is that ratings accuracy would decrease post SEC-certification. Ratings agencies might rationally exert less effort to rate firms, or due to the increased demand for ratings following the regulations, ratings analysts may not be able to spend as much time on determining ratings. This implies that ratings would become more random in the post period as opposed to deliberately inflated. We examine this alternative in two tests. First, we examine the ordinal integrity of ratings in the pre period versus the post period. We examine the default likelihood for each rating category to see whether the ordinal ranking for ratings is preserved in the post period. We find that the ordering of ratings is maintained in the post period, such that each lower rating category shows a higher probability of default than the rating category above it. For example, a Baa rated firm in the post period is 3.6 times more likely to default than an A rated firm, and a B rated firm is 3.1 times more likely to default than a Ba firm. For pre-period rated firms, these ratios are equal to 3.0 and 4.7 respectively.

[27] In untabulated results, we also examined whether stock market investors reacted differently to rating changes following SEC-certification. The stock market reaction to rating changes is not statistically different in the post SEC-certification. While several studies show that stock prices generally react to credit rating changes (e.g. Holthausen and Leftwich (1986) and Hand et al. (1992)), Goh and Ederington (1993)), the impact of the SEC certification could arguably impact returns either direction. On the one hand, if SEC-certification provided more power to rating agencies in the marketplace, we could expect that announcement returns would increase in the post period as investors rely more on these ratings. On the other hand, investors could anticipate a lower quality of credit ratings following the SEC-certification and would therefore react less to credit rating changes.

Our second test examines the likelihood of subsequent upgrades and downgrades following the initial rating.[28] If ratings are initially less accurate, we expect rating agencies to change ratings more frequently going forward. However if ratings are inflated, we expect a differential impact on the likelihood of downgrades relative to upgrades. The evidence in Table 14 is consistent with ratings inflation. From Panel A, we see that the likelihood of a subsequent downgrade increases by 5% (from 14% to 19%) and is statistically significant at the 1% level, but there is no significant difference for upgrades. Importantly, results from Panel B show that the effect is even stronger for Baa firms; in particular the likelihood of a subsequent downgrade increases by 9% (from 13% to 22%) and is statistically significant at the 5% level. We again find no significant difference for upgrades. This latter finding is consistent with our earlier findings that ratings inflation around the investment grade threshold seems to be particularly valuable for bond issuers.

Ratings inflation benefits institutional investors that are constrained by regulations, but losing accuracy in general would make ratings less attractive for non-constrained investors. Moody's appears to recognize this by having maintained accuracy generally while inflating ratings levels.

# 6 Conclusion

Ratings agencies are a source of significant controversy, most recently due to their alleged role in the financial crisis of 2007-2008, as well as with Enron and Worldcom and other high profile defaults. Despite this controversy, reforms to the rating system have been slow moving, as alternatives to the historical model are found to be as flawed as the current system. Two of the key institutional features of the credit rating industry are the widespread use of ratings in rules and regulations, and the restrictions placed on competition caused by

[28] We end the evaluative period for this test in March 1982 because Moody's introduced the notching system in April 1982, which could introduce a bias in the analysis; undoubtedly more upgrades and downgrades occur once ratings become finer.

the NRSRO (Nationally Recognized Statistical Ratings Organizations) designation system. Understanding the impact of these regulations on ratings quality is essential for addressing concerns about the current rating system. In this paper, we examine one of the watershed events in the history of credit ratings, the introduction of the NRSRO status, and its use in regulations. June 26, 1975 marks the launching date for the significant expansion of ratings use in rules and regulations, and the establishment of significant barriers to entry in the ratings industry.

The evidence we present in this paper is consistent with the regulatory changes instituted in June 1975 leading to ratings inflation. For the same given rating, a bond prior to June 1975 was less likely to default, less likely to have a deterioration in overall financials (as measured by the bond issuer's Altman z-score), and less likely to be downgraded to speculative grade than a bond with the same rating given in the years following the regulation change. In short, a bond rated Baa in 1976 was of lower quality than a bond rated Baa in 1974, before the regulations. We conduct several diagnostic tests to rule out other potential explanations for this change in quality, including differing macro environments at the time. Our results are focused on the overall change in credit quality conditional on ratings, but the ordering of ratings quality seems to have been preserved (that is, a Baa bond remains a worse credit than a Ba bond, for example, in the post period). We also present evidence that suggests that ratings agencies preserved to some extent the ratings quality for large firms to maintain their reputation, while inflating ratings of smaller, less visible firms.

Our paper speaks directly to the impact of competition on ratings quality. Some recent papers indicate that more competition can have a detrimental impact on ratings quality (e.g. Becker and Milbourn (2011), Manso (2013)). Our evidence indicates that restricting competition can have the opposite impact. By increasing barriers to entry and providing a captive customer base for ratings agencies, the new regulations of 1975 changed the incentive structure for ratings agencies, which led to a material impact on ratings quality. Any change to the ratings landscape today should consider the perverse incentives created by the regulatory environment initiated at that time.

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**Figure 1a: Default frequencies by rating category pre and post SEC-certification**
This figure presents the frequency of defaults by rating category for bond issues rated by Moody's both before and after the SEC-certification (introduction of NRSRO status in June 1975). For the pre SEC-certification issues, the ratings are taken as of May 1975. The ratings are taken at issuance for all issues post SEC certification. The y-axis shows the frequency of defaults over the period running from July 1975 to December 1987 for pre-period issues and from issuance date to December 1987 for all post-NRSRO bonds issued between July 1975 and December 1978.

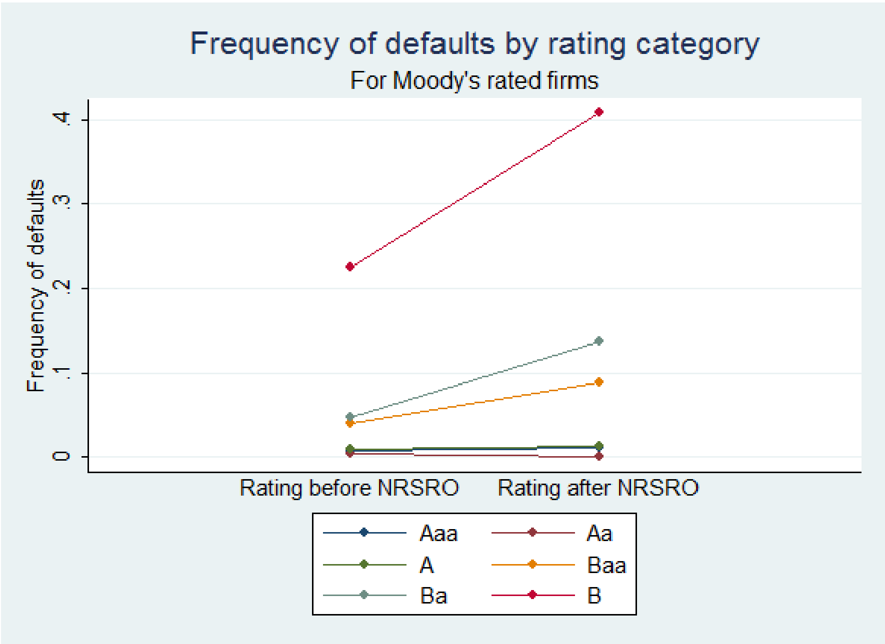
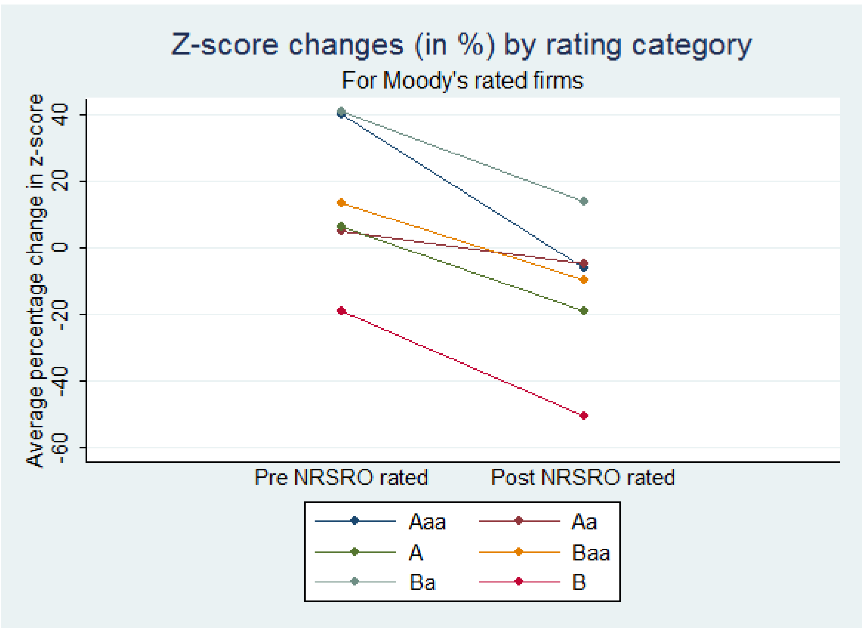



**Figure 1b: Z-score changes by rating category pre and post SEC-certification**
This figure presents the average Z-score change by rating category for issues rated by Moody's both before and after the SEC-certification (introduction of NRSRO status in June 1975). For the pre SEC-certification issues, the ratings are taken as of May 1975. The ratings are taken at issuance for all issues post SEC certification. The y-axis shows the average z-score change (in %) up to December 1987. For pre-NRSRO issues, the starting value for z-score is taken as of yearend 1974; as of the yearend prior to issuance for all post-NRSRO bonds issued between July 1975 and December 1978. We link the average changes in z-score across the two subsets of bond issuers within each categories in order to provide a visual aid as to the general pattern observed across all ratings pre and post SEC-certification.



## Table 1: Descriptive statistics

This table provides descriptive statistics for our sample. The default sample comprises all debt issues in our default tests. The SEC established the Nationally Recognized Statistical Rating Organization (NRSRO) certification in June 1975. The sample is comprised of all bond issues with an existing rating from Moody's as of May 1975 (pre-NRSRO sample) as well as all newly rated issues from July 1975 to December 1978 (post-NRSRO sample). In Panel A, we provide the number of observations by rating category and the industry distribution within our sample. In Panel B, we provide the number of observations for which firm-level data are available, the median total assets (in million USD), leverage ratio, pre-tax interest coverage ratio, and operating margin for both the pre and post NRSRO certification sample. For the pre-NRSRO sample, the values are taken as of yearend 1974, while the values for the post-NRSRO sample are taken as of the end of year in which the initial rating was assigned.

Panel A: Sample size and industry distribution

| | Rating distribution | | | Industry distribution | | | | |
|---|---|---|---|---|---|---|---|---|
| Rating category | #Pre | #Post | Total | Banking | Finance | Industrial | Public Utility | Transportation |
| Aaa | 390 | 97 | 487 | 7.8% | 7.6% | 77.4% | 4.3% | 2.9% |
| Aa | 326 | 94 | 420 | 6.4% | 19.1% | 52.6% | 19.8% | 2.1% |
| A | 752 | 167 | 919 | 2.5% | 11.9% | 54.2% | 26.7% | 4.7% |
| Baa | 330 | 69 | 399 | 0% | 3.8% | 56.1% | 33.1% | 7.0% |
| Ba | 124 | 22 | 146 | 0% | 0.7% | 50.6% | 34.3% | 14.4% |
| B | 57 | 56 | 113 | 0% | 0.9% | 80.5% | 1.8% | 16.8% |
| Caa-C | 12 | 0 | 12 | 0% | 0% | 33.3% | 0% | 66.7% |
| Totals | 1,991 | 505 | 2,496 | 3.5% | 9.7% | 59.7% | 21.4% | 5.7% |

Panel B: Sample Characteristics

| | Observations | | Assets | | Leverage | | Interest Coverage | | Operating Margin | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rating category | #Pre | #Post | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Aaa | 174 | 57 | 6,129 | 7,027 | 56.0% | 54.9% | 3.546 | 4.298 | 0.249 | 0.256 |
| Aa | 245 | 57 | 1,636 | 3,367 | 53.6% | 59.9% | 4.192 | 3.873 | 0.159 | 0.242 |
| A | 524 | 112 | 1,202 | 1,089 | 58.8% | 67.1% | 3.415 | 3.005 | 0.133 | 0.206 |
| Baa | 226 | 49 | 1,027 | 1,352 | 63.7% | 63.6% | 2.633 | 2.938 | 0.136 | 0.131 |
| Ba | 84 | 18 | 1,210 | 454 | 65.5% | 68.4% | 2.529 | 4.505 | 0.139 | 0.141 |
| B | 36 | 38 | 445 | 136 | 70.0% | 66.5% | 1.660 | 3.343 | 0.056 | 0.078 |
| Caa-C | 0 | 0 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| Average | 1,290 | 331 | 1,340 | 1,406 | 58.7% | 64.6% | 3.194 | 3.349 | 0.1559 | 0.1913 |

**Table 2: Default regressions**

This table presents results for our baseline predictive default regressions. The dependent variable is an indicator variable taking on the value of one if a default of the bond occurs within a given evaluative window after the introduction of the NRSRO status. In Panel A, the evaluative window over which a default can occur is from July 1975 to December 1987 for pre-NRSRO issues, and from the date of issuance to December 1987 for all post-NRSRO bonds issued between July 1975 and December 1978. In Panel B, the time window is 10 years for both pre and post samples, running from July 1975 to May 1985 for the pre-NRSRO rated sample and from December 1978 to December 1988 for the post-NRSRO newly rated issues. The post-dummy variable is an indicator variable for the post-NRSRO sample, i.e. for all new issues rated between July 1975 and December 1978. We include a rating dummy variable for each rating category. For each rating dummy, the variable take the value of one if a given bond is assigned the corresponding rating level, as of May 1975 for bonds issued in the pre SEC-certification period and at issuance for the bonds issued in the post SEC-certification period. We omit the Aaa category such that the coefficients of the rating level dummies have to be interpreted relative to that category. Industry fixed effects and bond maturity are included in some of our specifications, as indicated in the table. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

**Panel A: Defaults as of year-end 1987**

| | (I) | (II) | (III) | (IV) | (V) | (VI) |
|---|---|---|---|---|---|---|
| post-dummy | 0.0239** | 0.0264** | 0.0234* | 0.0345** | 0.0314** | 0.0291* |
| | [0.0103] | [0.0116] | [0.0137] | [0.0142] | [0.0141] | [0.0165] |
| Aa-dummy | -0.0064 | 0.0016 | -0.0002 | -0.0136 | -0.0034 | -0.0149 |
| | [0.0087] | [0.0090] | [0.0134] | [0.0177] | [0.0188] | [0.0275] |
| A-dummy | 0.0020 | 0.0092 | 0.0090 | -0.0087 | -0.0036 | -0.0189 |
| | [0.0105] | [0.0114] | [0.0168] | [0.0205] | [0.0208] | [0.0307] |
| Baa-dummy | 0.0400** | 0.0462** | 0.0660** | 0.0270 | 0.0305 | 0.0325 |
| | [0.0181] | [0.0190] | [0.0269] | [0.0254] | [0.0261] | [0.0370] |
| Ba-dummy | 0.0546** | 0.0602** | 0.0921** | 0.0369 | 0.0356 | 0.0350 |
| | [0.0260] | [0.0258] | [0.0406] | [0.0357] | [0.0348] | [0.0528] |
| B-dummy | 0.2590*** | 0.2530*** | 0.3018*** | 0.2186*** | 0.2006*** | 0.2008** |
| | [0.0504] | [0.0506] | [0.0599] | [0.0657] | [0.0660] | [0.0776] |
| Caa to C-dummy | 0.1632 | 0.1564 | 0.1032 | -0.0351 | -0.0829* | -0.1578** |
| | [0.1080] | [0.1086] | [0.1211] | [0.0388] | [0.0464] | [0.0688] |
| Asset size (mn USD) | | | | -0.0510 | -0.0469 | -0.1212 |
| | | | | [0.1368] | [0.2157] | [0.3154] |
| Leverage | | | | 0.0385 | 0.1238 | 0.2074* |
| | | | | [0.0534] | [0.0808] | [0.1145] |
| Interest coverage | | | | 0.0563 | 0.0669 | 0.1932 |
| | | | | [0.1012] | [0.1078] | [0.7823] |
| Operating margin | | | | -0.0310 | -0.0247 | -0.0466 |
| | | | | [0.0519] | [0.0603] | [0.0895] |
| Observations | 2,496 | 2,496 | 1,712 | 1,621 | 1,621 | 1,137 |
| Adjusted $R2$ | 0.113 | 0.119 | 0.144 | 0.095 | 0.105 | 0.126 |
| Industry fixed effects | No | Yes | Yes | No | Yes | Yes |
| Bond maturity | No | No | Yes | No | No | Yes |

| Panel B: Defaults over 10 years window<br>(Pre-period issues: [June 1975-May 1985] / Post-period issues: [Dec 1978- Dec 1988]) | | | | | | |
|---|---|---|---|---|---|---|
| | (I) | (II) | (III) | (IV) | (V) | (VI) |
| post-dummy | 0.0406*** | 0.0423*** | 0.0464*** | 0.0475*** | 0.0461*** | 0.0523*** |
| | [0.0112] | [0.0122] | [0.0143] | [0.0147] | [0.0145] | [0.0165] |
| Aa-dummy | -0.0007 | 0.0067 | 0.0080 | -0.0005 | 0.0085 | 0.0012 |
| | [0.0036] | [0.0048] | [0.0088] | [0.0066] | [0.0083] | [0.0138] |
| A-dummy | 0.0095 | 0.0162* | 0.0199 | 0.0022 | 0.0049 | -0.0080 |
| | [0.0070] | [0.0085] | [0.0136] | [0.0119] | [0.0121] | [0.0194] |
| Baa-dummy | 0.0416*** | 0.0472*** | 0.0676*** | 0.0320* | 0.0316* | 0.0332 |
| | [0.0156] | [0.0167] | [0.0240] | [0.0172] | [0.0178] | [0.0250] |
| Ba-dummy | 0.0479** | 0.0522*** | 0.0792** | 0.0287 | 0.0215 | 0.0107 |
| | [0.0205] | [0.0201] | [0.0323] | [0.0250] | [0.0228] | [0.0349] |
| B-dummy | 0.2160*** | 0.2110*** | 0.2494*** | 0.1702*** | 0.1490*** | 0.1388** |
| | [0.0455] | [0.0454] | [0.0544] | [0.0521] | [0.0519] | [0.0605] |
| Caa to C-dummy | 0.1727 | 0.1636 | 0.1108 | -0.0309 | -0.0805** | -0.1434** |
| | [0.1077] | [0.1083] | [0.1181] | [0.0305] | [0.0379] | [0.0554] |
| Asset size (mn USD) | | | | -0.1124 | -0.0932 | -0.2018 |
| | | | | [0.2125] | [0.1329] | [0.2002] |
| Leverage | | | | 0.0605 | 0.1512** | 0.2171** |
| | | | | [0.0446] | [0.0716] | [0.0983] |
| Interest coverage | | | | -0.0142 | 0.0173 | -0.3532 |
| | | | | [0.0623] | [0.0707] | [0.2511] |
| Operating margin | | | | -0.0327 | -0.0231 | -0.0358 |
| | | | | [0.0493] | [0.0580] | [0.0855] |
| Observations | 2,496 | 2,496 | 1,712 | 1,621 | 1,621 | 1,137 |
| Adjusted $R2$ | 0.102 | 0.107 | 0.126 | 0.091 | 0.105 | 0.130 |
| Industry fixed effects | No | Yes | Yes | No | Yes | Yes |
| Bond maturity | No | No | Yes | No | No | Yes |

### Table 3: Default regressions - Cox Proportional Hazard Model

The table shows hazard ratios from the estimation of a Cox proportional hazard model. For the pre issues, the duration is computed as the difference in days between the default date and May 31, 1975; between December 31, 1987 and May 31, 1975 in case of no default; and between May 31, 1975 and the date of maturity in case of a maturity before December 31, 1987. For the post issues, the duration is computed as the default date and the date of the initial rating; between December 31, 1987 and the date of the first rating in case of no default; and between the date of the initial rating and the maturity date in case of a maturity before December 31, 1987. The estimation is performed on the subset of bonds with data on time to maturity (same subsamples as those shown in columns (3) and (6) of Table 2). All other variables are defined in Table 2 and included as indicated in the table. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| Default until 1987: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| post-dum | 2.3978*** | 2.4594*** | 3.4304*** | 3.2579*** |
| | [0.6554] | [0.7119] | [1.1782] | [1.1383] |
| Asset size (mn USD) | | | 0.2326 | 5.6829 |
| | | | [4.7416] | [90.538] |
| Leverage | | | 6.5855 | 22.718** |
| | | | [10.163] | [35.792] |
| Interest coverage | | | 9.8377 | 1.0212 |
| | | | [76.459] | [9.3652] |
| Operating margin | | | 0.6867 | 1.5101 |
| | | | [2.3093] | [3.0945] |
| Observations | 1,712 | 1,712 | 1,137 | 1,137 |
| Pseudo $R2$ | 0.1438 | 0.1783 | 0.1441 | 0.1914 |
| Rating level fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | No | Yes | No | Yes |

**Table 4: Z-Score regressions**

This table presents the results for our baseline Z-score regressions. In Panel A, the dependent variable is an indicator variable taking on the value of one if the Altman Z-Score of a firm *decreases* between year-end 1974 and December 1987 for pre-NRSRO issues (and respectively year-end prior to the debt issuance and December 1987 for post-NRSRO issues) in column 1 and for 10 years after year-end 1974 (respectively year-end prior to issuance for post-NRSRO issues) in column 2. The negative change in Z-Score dummy is defined so as to reflect an increase in credit risk over our evaluative period. In Panel B, the table shows regression results with Z-Score levels as the dependent variable. It is defined with a negative sign so as to also reflect an increase in credit risk over the evaluative period. Starting Z-Score is the Altman Z-Score of the firm as of year-end 1974 for the pre SEC-certification bond issues and per year-end prior to the year in which the initial rating was assigned for the post SEC-certification bond issues. All other variables are defined in Table 2 and included as indicated in the table. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| Z-Score as of: | End of 1987 | After 10 years |
|---|---|---|
| **Panel A: Indicator for drop in Z-score levels** | | |
| post-dummy | 0.1482*** | 0.1930*** |
| | [0.0504] | [0.0658] |
| Starting Z-Score | 0.1725*** | 0.1488*** |
| | [0.0226] | [0.0199] |
| | | |
| Observations | 1,063 | 1,102 |
| Adjusted $R2$ | 0.204 | 0.194 |
| Rating level fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |
| **Panel B: Negative Z-Score levels** | | |
| post-dummy | 0.3098*** | 0.4210*** |
| | [0.1080] | [0.1186] |
| Starting Z-Score | -0.5859*** | -0.5593*** |
| | [0.0585] | [0.0529] |
| | | |
| Observations | 1,063 | 1,102 |
| Adjusted $R2$ | 0.480 | 0.448 |
| Rating level fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |

**Table 5: Downgrades to speculative grade (SG) regressions**

This table presents results for the downgrades to speculative grade (SG) regressions. Panel A provides statistics of the percentage of downgrades to SG by rating category. Panel B gives the regression results for all investment grade rated bonds while Panel C focuses only on Baa rated bonds. The dependent variable takes on the value of one if an investment grade bond is downgraded from investment grade to speculative grade over a given time frame. The time frame runs from June 1975 to yearend 1987 in column (1) and for 10 years as of May 1975 for pre-NRSRO rated bonds and for 10 years as of December 1978 for post-NRSRO newly rated bonds in column (2). All explanatory variables are defined in Table 2. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

**Panel A: Descriptive statistics**

| Percentage of downgrades to SG as of: | End of 1987 | | After 10 years | |
|---|---|---|---|---|
| | Pre | Post | Pre | Post |
| Aaa rated bonds | 1.03% | 7.22% | 1.03% | 7.77% |
| Aa rated bonds | 8.28% | 7.45% | 6.13% | 10.53% |
| A rated bonds | 11.04% | 20.96% | 7.18% | 21.74% |
| Baa rated bonds | 22.46% | 48.53% | 20.31% | 50.75% |

**Panel B: All Investment grade rated firms**

| Downgrades to SG as of: | End of 1987 | After 10 years |
|---|---|---|
| post-dummy | 0.0777*** | 0.1192*** |
| | [0.0273] | [0.0284] |
| Observations | 2,219 | 2,219 |
| Adjusted $R2$ | 0.084 | 0.095 |
| Rating level fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |

**Panel C: Only Baa rated firms**

| Downgrades to SG as of: | End of 1987 | After 10 years |
|---|---|---|
| post-dummy | 0.1905** | 0.2461** |
| | [0.0939] | [0.0952] |
| Observations | 393 | 392 |
| Adjusted $R2$ | 0.116 | 0.127 |
| Industry fixed effects | Yes | Yes |

**Table 6: Impact of firm size on ratings quality**

This table presents cross-sectional size-based regression results for our three main outcome variables. Panel A displays the results for defaults and drop in Z-score levels regressions for all firms, while Panel B shows the downgrades to speculative grade results for all investment grade rated bonds. The variable Size dummy is a dummy variable taking on the value of one if the bond issuer has assets which are larger than the median asset sizeof (1) all bond issuers in Panel A and (2) all investment grade bond issuers in Panel B in any given year. The post-size interaction variable interacts the post-dummy with the size dummy variable. All other control variables are defined in Tables 2, 3 and 4. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| Dependent variable per end of 1987: | Defaults | Indicator for drop in Z-score levels |
|---|---|---|
| **Panel A: All bonds** | | |
| post-dummy | 0.0533** | 0.1517** |
| | [0.0210] | [0.0635] |
| Size dummy | 0.0144 | 0.1784** |
| | [0.0121] | [0.0810] |
| post-size interaction | -0.0442* | -0.0151 |
| | [0.0228] | [0.1024] |
| Starting Z-Score | | 0.1768*** |
| | | [0.0217] |
| Observations | 1,704 | 1,063 |
| Adjusted $R2$ | 0.106 | 0.230 |
| Rating level fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |
| **Panel B: Investment grade bonds** | Downgrades to SG | |
| post-dummy | 0.0288 | |
| | [0.0343] | |
| Size dummy | 0.0213 | |
| | [0.0317] | |
| post-size interaction | 0.1008* | |
| | [0.0607] | |
| Observations | 1,520 | |
| Adjusted $R2$ | 0.128 | |
| Rating level fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |

## Table 7: Magnitude of ratings inflation

This table gauges the magnitude of ratings inflation for bond issues rated in the post SEC-certification period. We estimate the same predictive default regressions as in Table 2, whereby the dependent variable is an indicator variable taking on the value of one if a default of the bond occurs until December 1987. The first column replicates the results of Table 2. In Panel A, we deflate all post SEC-certification issue ratings by one (column 2) and two (column 3) rating categories, i.e. we change a Baa rating to Ba, etc. In Panel B, we inflate all pre SEC-certification issue ratings by one (column 2) and two (column 3) rating categories, i.e. we change a Ba rating to Baa, etc. All other control variables are defined in Table 2. Rating level and industry fixed effects are included in all specifications. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| **Panel A: Post SEC-certification issue ratings deflated by one and two rating categories** | | | |
|---|---|---|---|
| Defaults per end of 1987: | Baseline | One rating category | Two rating categories |
| post-dummy | 0.0239** | -0.0047 | -0.0344** |
| | [0.0103] | [0.0124] | [0.0144] |
| Observations | 2,496 | 2,495 | 2,492 |
| Adjusted *R*2 | 0.117 | 0.128 | 0.128 |
| Rating level fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |

| **Panel B: Pre SEC-certification issue ratings inflated by one and two rating categories** | | | |
|---|---|---|---|
| Defaults per end of 1987: | Baseline | One rating category | Two rating categories |
| post-dummy | 0.0239** | -0.0063 | -0.0432 |
| | [0.0103] | [0.0158] | [0.0305] |
| Observations | 2,496 | 2,009 | 1,589 |
| Adjusted *R*2 | 0.117 | 0.131 | 0.121 |
| Rating level fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |

**Table 8: Ratings Predictions Based on Moody's Pre-SEC regulation Ratings Model**

This table shows the average rating for the pre and post SEC regulation issued bonds for an unmatched and a matched sample of pre and post issues. A higher numerical rating indicates higher credit risk (worse letter rating). Unmatched refers to the average rating of all issues for the unmatched sample. Matched refers to a propensity score matched sample of pre issues where the propensity score was computed using the variables from Table 1, Panel B: Firm size, leverage, pre-tax interest coverage, and operating margin as well as industry fixed effects as matching variables. For the matching, we use the end of December 1973 values for the pre issues and the values of the year in which the rating was assigned for the post issues. The matching was done using a one-to-one nearest neighbor matching with replacement. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Average rating for: | Predicted rating | Actual rating | Difference | t-stat |
| Unmatched | 2.964 | 3.085 | 0.120 | 1.50 |
| Matched | 4.203 | 3.085 | - 1.118*** | -3.65 |

**Table 9: Default regressions – robustness tests**

This table presents several alternative specifications for our main predictive default regressions. All variables are defined in Table 2. In Panel A, we vary the time windows over which we measure default frequencies. Our baseline window in Table 2 ends in December 1987, we shorten the time window by one year in column (1) and we lengthen it by one year in column (3). In Panel B, we also end the pre SEC-certification sample period in December 1974; i.e. we exclude observations between January 1975 and May 1975 to account for the potential anticipation of the event. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| Defaults per end of: | 1986 | 1987 | 1988 |
|---|---|---|---|
| **Panel A: Different time periods** | | | |
| post-dummy | 0.0219** | 0.0264** | 0.0264** |
| | [0.0111] | [0.0116] | [0.0121] |
| Observations | 2,496 | 2,496 | 2,496 |
| Adjusted *R*2 | 0.122 | 0.121 | 0.115 |
| Rating level fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |
| **Panel B: Anticipation of event** | | | |
| post-dummy | 0.0240** | 0.0289** | 0.0280** |
| | [0.0120] | [0.0125] | [0.0130] |
| Observations | 2,351 | 2,351 | 2,351 |
| Adjusted *R*2 | 0.126 | 0.126 | 0.120 |
| Rating level fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |

**Table 10: Test for macro trends I: Excluding recession years**

This table shows results for our predictive default (Panel A), drop in Z-score levels (Panel B), and downgrades to SG (Panel C) regressions whereby we exclude specific time periods related to the 73-74 recession from our pre SEC-certification period. The first column displays our baseline results. In column (2), we remove all assigned ratings in 1973. In column (3), we remove all assigned ratings in 1974. In column (4), we remove all assigned ratings between November1973 and March 1975, which corresponds to the NBER defined recession period. All variables are defined in Table 2. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| Excluded time period: | None | 1973 | 1974 | Nov 1973 – March 1975 |
|---|---|---|---|---|
| **Panel A: Defaults** | | | | |
| post-dummy | 0.0264** | 0.0292** | 0.0295** | 0.0340** |
| | [0.0116] | [0.0121] | [0.0127] | [0.0142] |
| Observations | 2,496 | 2,368 | 2,262 | 2,138 |
| Adjusted *R*2 | 0.121 | 0.123 | 0.121 | 0.132 |
| Rating level fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| **Panel B: Indicator for drop in Z-score levels** | | | | |
| post-dummy | 0.1482*** | 0.1531*** | 0.1580*** | 0.1523*** |
| | [0.0504] | [0.0508] | [0.0506] | [0.0510] |
| Starting Z-Score | 0.1725*** | 0.1732*** | 0.1701*** | 0.1842*** |
| | [0.0226] | [0.0229] | [0.0224] | [0.0239] |
| Observations | 1,063 | 1,028 | 991 | 942 |
| Adjusted *R*2 | 0.204 | 0.204 | 0.207 | 0.219 |
| Rating level fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| **Panel C: Downgrades to SG** | | | | |
| post-dummy | 0.0777*** | 0.0764*** | 0.0861*** | 0.0807*** |
| | [0.0273] | [0.0280] | [0.0290] | [0.0309] |
| Observations | 2,219 | 2,107 | 1,987 | 1,865 |
| Adjusted *R*2 | 0.084 | 0.077 | 0.088 | 0.092 |
| Rating level fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |

**Table 11: Test for macro trends II: Rolling window placebo tests**

This table presents results for a rolling window of placebo (falsification) tests for our predictive default regressions. The dependent variables and all control variables are defined in Table 2. We replicate the estimation of specification (II) of Table 2 with 10 other placebo events. Specifically, we shift the event window by one year for every column, starting with 1970 in column (1) to 1980 in column (2). We shade column (6) as it represents the actual event window (see Table 2 Panel A, column 2). To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| | (1)<br>1970 | (2)<br>1971 | (3)<br>1972 | (4)<br>1973 | (5)<br>1974 | (6)<br>1975‘ | (7)<br>1976 | (8)<br>1977 | (9)<br>1978 | (10)<br>1979 | (11)<br>1980 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| post-dummy | 0.0023 | 0.0114 | 0.0099 | 0.0116 | 0.0131 | 0.0264** | 0.0361*** | 0.0169 | 0.0057 | 0.0007 | 0.0045 |
| | [0.0062] | [0.0097] | [0.0084] | [0.0113] | [0.0114] | [0.0116] | [0.0137] | [0.0127] | [0.0118] | [0.0121] | [0.0130] |
| Observations | 1650 | 1854 | 2102 | 2264 | 2397 | 2496 | 2663 | 2884 | 3094 | 3233 | 3215 |
| Adjusted *R*2 | 0.295 | 0.101 | 0.069 | 0.032 | 0.081 | 0.119 | 0.117 | 0.125 | 0.148 | 0.156 | 0.156 |
| Rating level fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

‘Event is June, 1975.

**Table 12: Test for macro trends III: 1981-1982 Recession**

This table presents results for placebo (falsification) tests for our predictive default regressions. The dependent variables and all control variables are defined in Table 2. We replicate the estimations of Table 2; however, we set the placebo event year to be 1983 instead of 1975. In doing so, we replicate the macro environment of our main test by also having a major recession in the two years prior to the event year; but the 1983 event year does not have the corresponding NRSRO introduction. If the recession confounds our results, we expect the post-dummy to load positively as in our baseline regression results in Table 2. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| | (I) | (II) | (III) | (IV) | (V) | (VI) |
|---|---|---|---|---|---|---|
| post-dummy | 0.0010 | -0.0042 | -0.0205* | -0.0127 | -0.0095 | -0.0202* |
| | [0.0093] | [0.0095] | [0.0112] | [0.0112] | [0.0103] | [0.0120] |
| Asset size (mn USD) | | | | -0.0900 | -0.0602 | -0.0248 |
| | | | | [0.1417] | [0.1486] | [0.1828] |
| Leverage | | | | -0.0560 | -0.0698 | -0.0612 |
| | | | | [0.1038] | [0.1108] | [0.1373] |
| Interest coverage | | | | -1.7124** | -1.7614** | -1.5895** |
| | | | | [0.7930] | [0.8020] | [0.7806] |
| Operating margin | | | | -0.0139 | -0.0050 | -0.0216 |
| | | | | [0.0519] | [0.0506] | [0.0459] |
| Observations | 6,104 | 6,100 | 4,997 | 3,084 | 3,084 | 2,455 |
| Adjusted $R2$ | 0.233 | 0.248 | 0.266 | 0.198 | 0.199 | 0.238 |
| Rating level fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | No | Yes | Yes | No | Yes | Yes |
| Bond maturity | No | No | Yes | No | No | Yes |

**Table 13: Is it a reaction to S&P's switch to issuer pay?**

This table shows results for predictive defaults, drop in Z-score levels, and downgrades to SG regressions over a sample window corresponding to a potential reaction of Moody's to S&P's switch to issuer pay. Specifically, the window of analysis is restricted to observations prior to May 1975 to isolate the change of S&P's payment model in June 1974 from the change in SEC's ratings regulation in June 1975 (introduction of NRSRO). The newly defined post-dummy variable takes a value of one for all new issues over the period from July 1974 to May 1975 and zero otherwise. All other variables are defined in Tables 2, 4 and 5. To save on space, we do not show coefficients for the rating level fixed effects. Standard errors clustered at the issuer level are shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| Dependent variable: | **Defaults** | **Indicator for drop in Z-score levels** | **Downgrades to SG** |
|---|---|---|---|
| post-dummy | 0.0010 | -0.0791 | -0.0375 |
| | [0.0122] | [0.0678] | [0.0255] |
| Starting Z-Score | | 0.1493*** | |
| | | [0.0244] | |
| Observations | 1,995 | 822 | 1809 |
| Adjusted *R*2 | 0.056 | 0.220 | 0.062 |
| Rating level fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |

## Table 14: Frequency of first rating changes

This table displays results for differences in frequency of the first rating change (upgrade or downgrade) for issues rated in the pre SEC-certification relative to issues rated in the post SEC-certification period. The evaluative period over which upgrades and downgrades are measured runs from July 1975 to March 1982 for pre SEC-certification rated bonds, and from issuance to March 1982 for post SEC-certification rated bonds issued between July 1975 and December 1978. The evaluative period ends in March 1982 just before the introduction of the notching system by Moody's. In Panel A, we report the regression results for all bonds, whereby we control for rating level fixed effects and use a post-period dummy variable to test for differences in the likelihood of being downgraded (column (1)) or upgraded (column (2)) between pre-period and post-period bond issues. In Panel B, we consider only issues that are initially rated Baa (above investment grade cutoff). ***, **, * indicate significance at the 1, 5, and 10 percent level, respectively.

| **Panel A: All bonds** | Downgrades | Upgrades |
|---|---|---|
| post-dummy | 0.0507*** | -0.0009 |
| | [0.0181] | [0.0145] |
| Observations | 2,466 | 2,466 |
| Adjusted *R*2 | 0.0225 | 0.0507 |
| Rating level fixed effects | Yes | Yes |
| **Panel B: Baa rated bonds only** | Downgrades | Upgrades |
| post-dummy | 0.0921** | -0.0567 |
| | [0.0467] | [0.0495] |
| Observations | 395 | 395 |
| Adjusted *R*2 | 0.0073 | 0.0008 |